

B. Perhitungan Penggunaan Katalis

$$\begin{aligned} \text{Diketahui} &= \rho \text{ Minyak} &= & 0.9087 \text{ gr/ml} \\ &\text{Massa Minyak} &= & 3000 \text{ ml} \times 0.9087 \text{ gr/ml} \\ &&= & 2726.1 \text{ gr} \\ &\text{Rasio mol Minyak : Methanol} &= & 1:7 \\ &\text{BE Triglycerida} &= & 256 \text{ gr/ek} \\ &\text{BM Methanol} &= & 32 \text{ gr/mol} \\ &\rho \text{ Methanol} &= & 0.792 \text{ gr/ml} \\ &\text{BM CaO} &= & 56.08 \text{ gr/mol} \end{aligned}$$

Penyelesaian

$$\begin{aligned} \text{Mol Triglycerida} &= \frac{\text{Massa Minyak}}{\text{BE Triglycerida}} \\ &= \frac{2726.1 \text{ gr}}{256 \text{ gr/ek}} \\ &= 10.6488 \text{ mol} \\ \text{Mol Methanol} &= 7 \times 10.6488 \text{ mol} \\ &= 74.5418 \text{ mol} \\ \text{Volume Methanol} &= \frac{\text{Mol Methanol} \times \text{BM Methanol}}{\text{Densitas Methanol}} \\ &= \frac{74.5418 \text{ mol} \times 32 \text{ gr/mol}}{0.792 \text{ gr/ml}} \\ &= 3011.789773 \text{ ml} \\ \text{Massa Methanol} &= 3011.789773 \text{ ml} \times 0.792 \text{ gr/ml} \\ &= 2385.3375 \text{ gr} \\ - \text{ 0,5 \% Katalis} \\ \text{Massa CaO} &= 0,5 \% \times \text{Massa Minyak} \\ &= 0.005 \times 2726.1 \text{ gr} \\ &= 13.6305 \text{ gr} \\ \text{Mol CaO} &= \frac{\text{Massa CaO}}{\text{BM CaO}} \\ &= \frac{13.6305 \text{ gr}}{56.0777 \text{ gr/mol}} \\ &= 0.2431 \text{ mol} \end{aligned}$$

	CaO	+ 2CH ₃ OH	→ (CH ₃ O) ₂ Ca	+ H ₂ O	
m :	0.2431	0.2431	-	-	mol
b :	0.2431	0.1215	0.2431	0.2431	mol
s :	0	0.121532	0.2431	0.2431	mol

$$\begin{aligned}
 \text{Mol CH}_3\text{OH} &= 0.1215 \text{ mol} \\
 \text{Mol CH}_3\text{OH} &= \frac{\text{Massa CH}_3\text{OH}}{\text{BM CH}_3\text{OH}} \\
 0.1215 \text{ mol} &= \frac{\text{Massa CH}_3\text{OH}}{32 \text{ gr/mol}} \\
 \text{Massa CH}_3\text{OH} &= 0.1215 \text{ mol} \times 32 \text{ gr/mol} \\
 &= 3.8890 \text{ gr}
 \end{aligned}$$

$$\begin{aligned}
 \text{Volume Methanol} &= \frac{\text{Massa Methanol}}{\text{Densitas Methanol}} \\
 &= \frac{3.8890 \text{ gr}}{0.792 \text{ gr/ml}} \\
 &= 4.9104 \text{ ml}
 \end{aligned}$$

Penggunaan Jumlah Bahan Baku

Rasio Molar Minyak : Methanol adalah 1 : 7

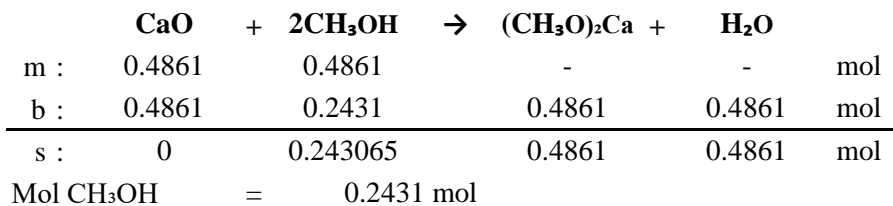
Banyak Katalis yang digunakan adalah 0,5 %

No.	Bahan	Massa (gr)	Volume (ml)
1.	Minyak	2726.1	3000
2.	Methanol	2385.3375	3011.7898
3.	CaO	13.6305	6.3996
4.	Methanol (Katalis)	3.8890	4.9104

- 1 % Katalis

$$\begin{aligned}
 \text{Massa CaO} &= 1\% \times \text{Massa Minyak} \\
 &= 0.01 \times 2726.1 \text{ gr} \\
 &= 27.261 \text{ gr}
 \end{aligned}$$

$$\begin{aligned}
 \text{Mol CaO} &= \frac{\text{Massa CaO}}{\text{BM CaO}} \\
 &= \frac{27.261 \text{ gr}}{56.0777 \text{ gr/mol}} \\
 &= 0.4861 \text{ mol}
 \end{aligned}$$



$$\begin{aligned} \text{Mol CH}_3\text{OH} &= \frac{\text{Massa CH}_3\text{OH}}{\text{BM CH}_3\text{OH}} \\ 0.2431 \text{ mol} &= \frac{\text{Massa CH}_3\text{OH}}{32 \text{ gr/mol}} \\ \text{Massa CH}_3\text{OH} &= 0.2431 \text{ mol} \times 32 \text{ gr/mol} \\ &= 7.7781 \text{ gr} \end{aligned}$$

$$\begin{aligned} \text{Volume Methanol} &= \frac{\text{Massa Methanol}}{\text{Densitas Methanol}} \\ &= \frac{7.7781 \text{ gr}}{0.792 \text{ gr/ml}} \\ &= 9.8208 \text{ ml} \end{aligned}$$

Penggunaan Jumlah Bahan Baku

Rasio Molar Minyak : Methanol adalah 1 : 7

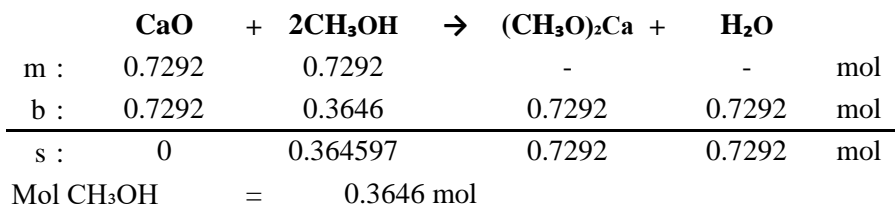
Banyak Katalis CaO yang digunakan adalah 1 %

No.	Bahan	Massa (gr)	Volume (ml)
1.	Minyak	2726.1	3000
2.	Methanol	2385.3375	3011.7898
3.	CaO	27.2610	12.7992
4.	Methanol (Katalis)	7.7781	9.8208

- 1,5 % Katalis

$$\begin{aligned} \text{Massa CaO} &= 1.5 \% \times \text{Massa Minyak} \\ &= 0.015 \times 2726.1 \text{ gr} \\ &= 40.8915 \text{ gr} \end{aligned}$$

$$\begin{aligned} \text{Mol CaO} &= \frac{\text{Massa CaO}}{\text{BM CaO}} \\ &= \frac{40.8915 \text{ gr}}{56.0777 \text{ gr/mol}} \\ &= 0.7292 \text{ mol} \end{aligned}$$



$$\begin{aligned} \text{Mol CH}_3\text{OH} &= \frac{\text{Massa CH}_3\text{OH}}{\text{BM CH}_3\text{OH}} \\ 0.3646 \text{ mol} &= \frac{\text{Massa CH}_3\text{OH}}{32 \text{ gr/mol}} \\ \text{Massa CH}_3\text{OH} &= 0.3646 \text{ mol} \times 32 \text{ gr/mol} \\ &= 11.6671 \text{ gr} \end{aligned}$$

$$\begin{aligned} \text{Volume Methanol} &= \frac{\text{Massa Methanol}}{\text{Densitas Methanol}} \\ &= \frac{11.6671 \text{ gr}}{0.792 \text{ gr/ml}} \\ &= 14.7312 \text{ ml} \end{aligned}$$

Penggunaan Jumlah Bahan Baku

Rasio Molar Minyak : Methanol adalah 1 : 7

Banyak Katalis CaO yang digunakan adalah 1,5 %

No.	Bahan	Massa (gr)	Volume (ml)
1.	Minyak	2726.1	3000
2.	Methanol	2385.3375	3011.7898
3.	CaO	40.8915	19.1988
4.	Methanol (Katalis)	11.6671	14.7312

- 2 % Katalis

$$\begin{aligned} \text{Massa CaO} &= 2\% \times \text{Massa Minyak} \\ &= 0.02 \times 2726.1 \text{ gr} \\ &= 54.522 \text{ gr} \end{aligned}$$

$$\begin{aligned} \text{Mol CaO} &= \frac{\text{Massa CaO}}{\text{BM CaO}} \\ &= \frac{54.522 \text{ gr}}{56.0777 \text{ gr/mol}} \\ &= 0.9723 \text{ mol} \end{aligned}$$

	CaO	+ 2CH ₃ OH	→ (CH ₃ O) ₂ Ca	+ H ₂ O	
m :	0.9723	0.9723	-	-	mol
b :	0.9723	0.4861	0.9723	0.9723	mol
s :	0	0.486129	0.9723	0.9723	mol

$$\text{Mol CH}_3\text{OH} = 0.4861 \text{ mol}$$

$$\text{Mol CH}_3\text{OH} = \frac{\text{Massa CH}_3\text{OH}}{\text{BM CH}_3\text{OH}}$$

$$0.4861 \text{ mol} = \frac{\text{Massa CH}_3\text{OH}}{32 \text{ gr/mol}}$$

$$\text{Massa CH}_3\text{OH} = 0.4861 \text{ mol} \times 32 \text{ gr/mol}$$

$$= 15.5561 \text{ gr}$$

$$\text{Volume Methanol} = \frac{\text{Massa Methanol}}{\text{Densitas Methanol}}$$

$$= \frac{15.5561 \text{ gr}}{0.792 \text{ gr/ml}}$$

$$= 19.6416 \text{ ml}$$

Penggunaan Jumlah Bahan Baku

Rasio Molar Minyak : Methanol adalah 1 : 7

Banyak Katalis CaO yang digunakan adalah 2 %

No.	Bahan	Massa (gr)	Volume (ml)
1.	Minyak	2726.1	-3000
2.	Methanol	2385.3375	3011.7898
3.	CaO	54.5220	25.5984
4.	Methanol (Katalis)	15.5561	19.6416

- 2,5 % Katalis

$$\text{Massa CaO} = 2.5 \% \times \text{Massa Minyak}$$

$$= 0.025 \times 2726.1 \text{ gr}$$

$$= 68.1525 \text{ gr}$$

$$\text{Mol CaO} = \frac{\text{Massa CaO}}{\text{BM CaO}}$$

$$= \frac{68.1525 \text{ gr}}{56.0777 \text{ gr/mol}}$$

$$= 1.2153 \text{ mol}$$

	CaO	+ 2CH ₃ OH	→ (CH ₃ O) ₂ Ca	+ H ₂ O	
m :	1.2153	1.2153	-	-	mol
b :	1.2153	0.6077	1.2153	1.2153	mol
s :	0	0.607661	1.2153	1.2153	mol

$$\text{Mol CH}_3\text{OH} = 0.6077 \text{ mol}$$

$$\text{Mol CH}_3\text{OH} = \frac{\text{Massa CH}_3\text{OH}}{\text{BM CH}_3\text{OH}}$$

$$0.6077 \text{ mol} = \frac{\text{Massa CH}_3\text{OH}}{32 \text{ gr/mol}}$$

$$\begin{aligned} \text{Massa CH}_3\text{OH} &= 0.6077 \text{ mol} \times 32 \text{ gr/mol} \\ &= 19.4452 \text{ gr} \end{aligned}$$

$$\begin{aligned} \text{Volume Methanol} &= \frac{\text{Massa Methanol}}{\text{Densitas Methanol}} \\ &= \frac{19.4452 \text{ gr}}{0.792 \text{ gr/ml}} \\ &= 24.5520 \text{ ml} \end{aligned}$$

Penggunaan Jumlah Bahan Baku

Rasio Molar Minyak : Methanol adalah 1 : 7

Banyak Katalis CaO yang digunakan adalah 2,5 %

No.	Bahan	Massa (gr)	Volume (ml)
1.	Minyak	2726.1	3000
2.	Methanol	2385.3375	3011.7898
3.	CaO	68.1525	31.9980
4.	Methanol (Katalis)	19.4452	24.5520